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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/038,371

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Gerald W. Gibson JR.

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23363

7590

10/22/2003

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EXAMINER

CHU, CHRIS C

ART UNIT

PAPER NUMBER

2815

DATE MAILED: 10/22/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/038,371

Applicant(s)

GIBSON ET AL.

Examiner

Chris C. Chu

Art Unit

2815

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 16 May 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1 - 15 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1 - 15 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☒ The proposed drawing correction filed on 16 May 2003 is: a) ☐ approved b) ☒ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 9.
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

## DETAILED ACTION

### *Response to Amendment*

1. Applicant's amendment filed on May 16, 2003 has been received and entered in the case.

### *Claim Rejections - 35 USC § 102*

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

3. Claims 1, 3 ~ 5, 9 and 10 are rejected under 35 U.S.C. 102(e) as being anticipated by Chooi et al.

Regarding claim 1, Chooi et al. discloses in Fig. 16, column 5, line 51, and column 8, lines 44 ~ 46 a semiconductor product comprising a barrier layer (24 and 34) disposed between a copper-containing structure (20 and 12) and a low-k dielectric film (50), said barrier layer (24 and 34) comprising a composite film structure including a nitrogen-containing, substantially oxygen-free first film (24) forming a boundary with said copper-containing structure and an

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oxygen-containing, substantially nitrogen-free second film (34) forming a boundary with said low-k dielectric film.

Regarding claim 3, Chooi et al. discloses in Fig. 16, column 5, line 51, and column 6, lines 6 ~ 17 first film comprising silicon nitride and said second film comprising silicon dioxide.

Regarding claim 4, Chooi et al. discloses in Fig. 16 said copper-containing structure comprising a surface including a copper wire (20) formed within an insulating material (12).

Regarding claim 5, Chooi et al. discloses in Fig. 16 said barrier layer (24 and 34) being formed on said copper-containing structure and said low-k dielectric film is formed on said barrier layer.

Regarding claim 9, Chooi et al. discloses in Fig. 16 and column 6, lines 12 ~ 17 said low-k dielectric film having a dielectric constant less than 3.5.

Regarding claim 10, Chooi et al. discloses in Fig. 16, column 5, line 51, and column 6, lines 6 ~ 17 a semiconductor product comprising a barrier layer (24 and 34) disposed between a readily-oxidizable conductive material (20) and a low-k dielectric film (50), said barrier layer comprising a composite film structure including a nitrogen-containing, substantially oxygen-free first film (24) forming a boundary with said conductive material and an oxygen-containing, substantially nitrogen-free second film (34) forming a boundary with said low-k dielectric film.

### ***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chooi et al. in view of Grill et al.

Regarding claim 8, Chooi et al. discloses the claimed invention except for said low-k dielectric film being formed of SiOC-H. However, Grill et al. discloses in column 11, lines 19 ~ 23 a low-k dielectric film being formed of SiOC-H. Thus, it would have been obvious to one of ordinary skill in the art at the time when the invention was made to modify Chooi et al. by using the SiOC-H for the low-k dielectric film as taught by Grill et al. The ordinary artisan would have been motivated to modify Chooi et al. in the manner described above for at least the purpose of providing etch selectivity (column 6, lines 26 ~ 37).

***Allowable Subject Matter***

6. Claims 2, 6, 7 and 11 – 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claims 2 contains allowable subject matter because none of references of record teach or suggest, either singularly or in combination, at least the limitation of a first film comprising nitrogen-doped silicon carbide, and a second film comprising oxygen-doped silicon carbide.

Claims 6 and 7 contain allowable subject matter because none of references of record teach or suggest, either singularly or in combination, at least the limitation of an oxygen-doped silicon carbide for an insulating film and an insulating hardmask.

7. The following is an examiner's statement of reasons for allowance:

Regarding claims 11 ~ 15, the prior art of record does not teach or suggest, either singularly or in combination, at least an oxygen-doped silicon carbide for an insulating film and an insulating hardmask.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

### ***Response to Arguments***

8. Applicant's arguments filed on May 16, 2003 have been fully considered but they are not persuasive.

On page 6, applicant argues "the cited reference of Chooi does not teach a barrier layer disposed between a copper-containing structure and a low-k dielectric film because Chooi does not teach a low-k dielectric film." This argument is not persuasive. Chooi et al. discloses in Fig. 16, column 5, line 51, and column 8, lines 44 ~ 46 a semiconductor product comprising a barrier

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layer (24 and 34) disposed between a copper-containing structure (20 and 12) and a low-k dielectric film (50). Furthermore, Gaillard et al., cited herein for evidence purpose, clearly discloses in column 1, lines 51 ~ 53 the FSG in Chooi does in fact include a low-k dielectric film (about 3.4 or 3.6). As explained in the above, Chooi discloses a “low-k dielectric film”.

For the above reasons, the rejection is maintained.

### ***Conclusion***

9. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Chris C. Chu whose telephone number is (703) 305-6194. The examiner can normally be reached on M-F (10:30 - 7:00).

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If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Eddie C. Lee can be reached on (703) 308-1690. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 308-7382 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.

Chris C. Chu  
Examiner  
Art Unit 2815

c.c.  
October 3, 2003

  
**GEORGE ECKERT**  
**PRIMARY EXAMINER**